except in the Black Hills, a poor outlook for hay, and serious damage to small grains and other crops. The shipping of live stock from that section of the State has been excessive for the season. Many new settlers on land between the Missouri River and the eastern border of the Black Hills have been forced to move out. In parts of that section some of the seeds sown did not come up, owing to dry soil, and in places there was little new pasturage until near the middle of June. There were, of course, some localities that were favored with good showers and severe damage was averted. The eastern portion of the State fared somewhat better in the matter of rainfall, but there also insufficient moisture, with excessive heat and sunshine, caused serious damage to small grains and grasses in most counties, although there were limited localities where opportune rains prevented serious damage. In this section corn did well; it made unusual progress for the season on account of the warm nights. The grass crop, however, is short and under the most favorable conditions from now till the close of the season its yield can hardly be other than deficient. Owing to drought, and in some cases to lightning, fires were numerous in the Black Hills, and tree seeds sown on 1,000 acres in the national forest have not germinated properly. In all portions of the State conditions resulting from insufficient rainfall and excessive heat have been intensified by the dry state of the subsoil at the beginning of the season.

Nebraska.—June, 1911, was the warmest and driest recorded since 1876. The records in the State extend back to 1849, but previous to 1876 the number of stations was small. The 8 stations with a record in 1870 and the 3 in 1857 and 1859 indicate that the rainfall in those three years was as light, or probably lighter, in June than in the month just passed. The deficiency in rainfall was greatest in the southeastern section, as it averaged less than one-sixth of the normal and for considerable areas the total fall for the month was about half an inch. In parts of the central and northeastern sections the rainfall was normal, or slightly more than normal; this also was the case in the North Platte Valley. The cloudiness was much less than the average for the season. The mean for the entire State was 20 clear days, 9 partly cloudy, and 1 cloudy, a remarkable record for June in Nebraska.

Kansas.—The maximum temperatures were above 100° at every station. They were 110° or more in the Smoky Hill Valley from Gove County eastward, in the Solomon Valley from Osborne south, in the Republican Valley from Republic County south, and in the Blue Valley. In the Kansas Valley they ranged from 112° at the mouth of the Republican to 100° at Kansas City, Mo. The precipitation was below normal at all stations. The average number of rainy days was 3, the smallest number on record. No April, May, June, July, August, or September since records began has been as dry as June, 1911. Hot winds occurred on several days.

Iowa.—June is usually a wet and cool month in this section, but this year the temperatures were abnormally high and the rainfall was exceptionally light, except at a few stations in the extreme northern part of the State, where moderately heavy showers occurred on the night of the 25th. However, there was only one station that received an excess of moisture. The showers were light, widely scattered, and occurred at long intervals, except between the 14th and 17th, when they were quite general, but even then the amounts were small at most stations. The temperatures were high most of the time. The intense sunshine, and long-continued drought and the excessively high temperatures were damaging to all late crops except corn, and that was injured to some extent where the drought was most severe.

Missouri.—The month was the warmest and driest June of which we have a record. Both the heat and the dry weather began early in May, and high temperatures were continuous, save a few short interruptions. The areas in which the period of dry weather was broken by beneficial showers were scattered and limited in extent. At the close of the month pastures were as dry and brown as in late summer, and most crops had suffered. All streams were low and some were completely dry. In the southwestern part of the State it was reported that many wells had gone dry, and some of them were reported never to have failed before in the last 40 years or more.

THE EROSION OF SIOUX POINT, SOUTH DAKOTA.

By G. W. McDOWALL, Local Forecaster, United States Weather Bureau.

Within the past few years the Missouri River has encroached rapidly upon the South Dakota shore line for a distance of 3,000 yards above the junction of the Missouri and Big Sioux Rivers. Little attention was paid to the cutting till 1909, as no immediate loss was threatened except that of pasture and cultivable land. About that time it was feared that, unless checked, it might soon devour all of Sioux Point and reaching across the present bed of the Big Sioux destroy the Iowa shore as far back as the bluffs. This would include the fair grounds and boat-club properties as well as the electric and C., M. & St. P. Railway tracks, and cause the inundation of lowlands on both sides of the Big Sioux for one-half mile upstream.

In 1910 an appropriation of $32,500 was granted by the Government for the purpose of shore protection along this bank on condition that an equal amount be raised by local subscription. The money was not raised, as it was thought the channel would automatically shift southward, but cutting continued at such a rapid rate that conditions became critical during the spring of 1911, and the conclusion was unavoidable that immediate action was necessary to save the threatened properties. A delegation was sent to Washington in June, and an increased appropriation was secured, leaving but $16,000 to be raised locally. About $11,000 of this has been pledged and the remainder is in sight. It is intended to protect the shore by riprapping from Gumbo Point to Sioux Point, a distance of about 3,500 yards. A woven mat, 75 to 80 feet wide, will be used, one side being ballasted with rock and sunk in the stream, the other reaching up over the bank. The bank will then be rock paved over its entire face. About 1,500 yards from Sioux Point a dike will be built to deflect the current. Requisition has been made for the necessary materials and these are being gathered as rapidly as possible. Plans are under way to commence construction within a few days and the completion of the work is expected this summer.

The soil of the threatened bank is of gumbo and sand composition and offers little resistance to the encroaching stream. Nearer the junction of the streams the shore is heavily wooded and the work of the river has been materially hindered by the tree roots. The bank rises almost 15 feet above the present surface of the water till within 300 yards of Sioux Point, whence it is little more than 3 feet above the stream. A river stage of 14 feet would submerge this lowland and it would be swept away almost at once. Another source of danger is the old river bed paralleling the shore line for several hundred yards and only distant therefrom a few rods. Upon the first breach in this wall the water will pour through the old channel and it will be too late to save Sioux Point.

FLOODS OF THE UPPER MISSOURI RIVER.

By C. D. REED, Local Forecaster, United States Weather Bureau.

Little has been published on the subject of flood conditions and fluctuations of river stages in the upper Missouri River. It is therefore hoped that this short article, treating of some phases of the subject, may be interesting to those who are now trying to revive navigation, to those who are engaged in bank protection and other works of construction along the stream, and to the many farmers who venture to till the broad acres of unusually fertile land subject to occasional overflow that lie adjacent to the river through several States.

The conclusions reached proceed from 10 years' study of the stream, during a considerable portion of which the writer was in charge of the river and flood service of the Weather Bureau on the Missouri River and tributaries at and above Sioux City, Iowa. The scope of the paper will therefore be confined to that portion of the river.

The drainage area of the Missouri River above Sioux City includes four-fifths of Montana, considerable territory in the Provinces of Alberta and Saskatchewan in